STATIC AND DYNAMIC DEFORMATIONS OF FUNCTIONALLY GRADED PLATES BY MESHLESS LOCAL PETROV-GALERKIN METHOD

R. C. Batra[a], L. F. Qian[b] and L. M. Chen[b]

[a]Department of Engineering Science and Mechanics, M/C 0219
Virginia Polytechinc Institute and State University
Blacksburg, VA 24061, USA

[b]Nanjing University of Science and Technology
Nanjing 210094, P.R. China

We have used the Batra-Vidoli higher order shear and normal deformable plate theory to analyze static and dynamic deformations of linear elastic anisotropic and inhomogeneous thick plates under different boundary conditions by using a meshless local Petrov-Galerkin method. Computed results for simply supported plates are found to match very well with the available analytical solutions. The macroscopic response of inhomogeneous plates made of two isotropic constituents has been assumed to be isotropic and the effective elastic moduli have been computed by using the Mori-Tanaka technique. Volume fractions of constituents that maximize the lowest frequency, minimize the maximum principal stress, and minimize the tip deflection of a cantilever beam/plate have also been computed. Both for static and dynamic problems, deflections and through-the-thickness distributions of the transverse shear and the trans verse normal stresses computed with equations of the 5th order plate theory have been found to match very well their analytical values.

References

[1] R. C. Batra and S. Vidoli, Higher-order piezoelectric plate theory derived from a mixed variational principle*, AIAA J*., 40, 91-104, 2002.

[2] R. C. Batra, S. Vidoli and F. Vestroni, Plane wave solutions and modal analysis in higher order shear and normal deformable plate theories, *J. Sound and Vibrations*, 257, 63-88, 2002.

[3] L. F. Qian, R. C. Batra and L. M. Chen, Elastostatic deformations of a thick plate by using a higher-order shear and normal deformable plate theory and two meshless local Petrov-Galerkin methods, *Computer Modeling in Engineering and Sciences,* 4, 161-176, 2003.

[4] L. F. Qian, R. C. Batra and L. M. Chen, Free and forced vibrations of thick rectangular plates by using a higher-order shear and normal deformable plate theory and meshless local Petrov-Galerkin method, *Submitted for publication*.

[5] L. F. Qian, R. C. Batra and L. M. Chen, Static and dynamic deformations of thick functionally graded plate elastic plates by using a higher-order shear and normal deformable plate theory and meshless local Petrov-Galerkin method, *Submitted for publication.*